

DOCUMENT 00 11 13
ADVERTISEMENT FOR BIDS

Owner: Duchesne County Road Department
 PO Box 356
 Duchesne Utah 84021

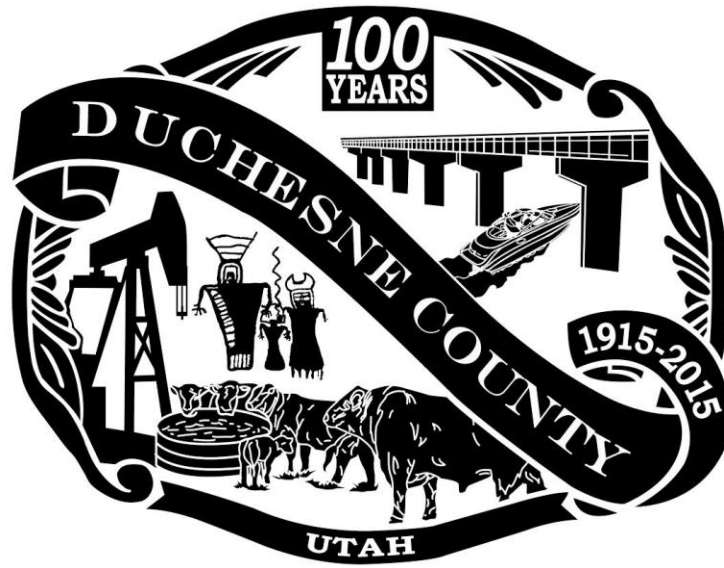
Separate sealed BIDS for the Duchesne County – 2021 Pavement Management On-Call Contract which includes paving, roadway sweeping, and trucking services as well as hot mix asphalt material, and related work, will be received by Duchesne County Road Department at 20800 West East River Road, Duchesne Utah, until April 15th, 2021 at 4 P.M and then publicly opened and read aloud at the Duchesne County Commission Meeting April 19th, 2021 at 9 A.M.

The Issuing Office for the Bidding Documents is of Jones & DeMille Engineering, Inc., 520 West Hwy 40, Roosevelt, UT 84066, (435) 722-8267. For questions regarding the Bidders List and accessing Invitation to Bid and Bid Documents, email Jennifer at jennifer.b@jonesanddemille.com ; for project specific or technical questions, email Eric Major, PE at eric.m@jonesanddemille.com or Jeff Baker, PE at jeff.b@jonesanddemille.com.

Bids will be received for a single prime Contract. Bids shall be on a unit price basis as indicated in the Bid Form.

March 25, 2021

Ben Henderson, Road Department Head



DUCHESNE COUNTY

INVITATION TO BID AND CONTRACT FOR

2021 Pavement Management On-Call Contract

PREPARED BY:

DUCHESNE COUNTY
ROAD DEPARTMENT

4/1/2021

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I. Invitation to Bid

A. Purpose

Duchesne County is soliciting bids from qualified contractors for paving, sweeping, and trucking services as well as hot mix asphalt material and other associated rates and materials for an on-call contract to assist the County with roadway maintenance needs in 2021.

B. Information Regarding the Bid can be Obtained by Contacting:

Duchesne County Road Department

(435) 738-2468

PO BOX 356 Duchesne UT, 84021

20800 West East River Road Duchesne, UT 84021

C. Proposal Due Date

All bids are due in the Road Department of Duchesne County located at the above address on or before April 22, 2021 at 4:00 P.M. Any bid received after this time will be considered late and subject to be returned unopened to the bidder. Bids shall clearly indicate the name, address, and telephone number of the proposer. Bids shall be signed and dated by a person with the authority to legally bind the proposer to the submitted proposal.

D. Basis of Award

The contract will be awarded to the lowest responsive, responsible bidder. The term "responsive bidder" means a person or business entity that has submitted a bid which conforms in all material respects to the invitation to bid. The term "responsible bidder" means a person or business entity who has the capability in all respects to fully perform the contract requirements and who has the integrity and reliability which will assure good faith performance. In determining who is the lowest responsive, responsible bidder, in addition to price, the County may consider factors relevant to the successful operation of the County's business and the best interests of the County as a whole.

E. Award Date

Contract will be announced and awarded on April 26, 2021.

II. Scope of Services

A. Scope of Services

i. 2021 Pavement Management On-Call Contract

1. Duchesne County Road Department desires to contract with a qualified contractor to provide paving, sweeping, and trucking services and hot-mix asphalt material on an as-needed basis to assist the Road Department with their roadway maintenance needs.
2. Bid schedule describing unit price services:

Item	Description	Unit	Estimated Quantity*	Unit Price	Bid Total for Comparison
1	Paver with Crew	Daily Rate	10		\$ -
2	Roadway Sweeping	Daily Rate	10		\$ -
3	Trucking (Side Dump)	Hourly	100		\$ -
4	Trucking (End Dump)	Hourly	100		\$ -
5	Hot Mix Asphalt (58-28)**	Ton	500		\$ -
6	Hot Mix Asphalt (64-34)***	Ton	500		\$ -
7	Roller (Single Drum)	Daily Rate	10		\$ -
8	Roller (Double Drum)	Daily Rate	10		\$ -
9	Roller (48" Drum)	Daily Rate	10		\$ -
Total Bid for Comparison				\$	-
Notes:					
*Estimated Quantities are given for Pricing Comparison only, they do not represent or imply that quantity of work is guaranteed; Contractor will work with County on an as-requested basis.					
**HMA 58-28 to be utilized in smaller quantities for patching and where designated, minimum of 5 tons					
***HMA 64-34 to be utilized in larger patches being done with a paver crew where designated, minimum lot of 50 tons.					

III. Instructions for Bidders

A. General Bid Requirements

- i. The Bid sheet included in this Invitation to Bid must be fully completed and returned with the Bid. Type or neatly print the date, company name, and the full legal name and title of the person(s) signing the Bid in the place provided at the bottom of Section IV Official Bid on page 7.
- ii. Five (5) copies of Bid must be submitted.
- iii. The envelope in which the Bid response is submitted must be sealed and clearly labeled with the project title and the name of the company or individual submitting the proposal. Bids must be received by the opening date and time shown on this Bid in order to be considered.
- iv. The original and the required number of copies of the Bid must be returned to:
Duchesne County Road Department
(435) 738-2468
PO BOX 356 Duchesne UT, 84021
20800 West East River Road Duchesne, UT 84021
- v. All Bid prices must be audited by the Bidder to ensure correctness before the Bid is submitted. The Bidder is solely responsible for the accuracy of information placed on a Bid sheet, including prices. Clerical or mathematical error is insufficient to void a successful Bid but a Bidder may withdraw a sealed Bid prior to opening without a penalty.
- vi. A Bidder may submit only one (1) Bid response for each specific Bid solicitation unless otherwise authorized in the specifications.
- vii. All prices submitted by the Bidder to Duchesne County must be guaranteed by the authorized person(s) against any price increase for the time period designated in the Bid specifications, and Duchesne County must be given the benefit of any price decrease occurring during such designated time period.
- viii. All Bidders must specify in the Bid response the earliest actual delivery date for each item unless otherwise specified in writing by Duchesne County. The delivery date may be a factor in deciding the Bidder's capability to perform.
- ix. All invoices must reflect a Duchesne County Purchase Order Number, which can be obtained by calling the Road Department Office at (435) 738-2468.
- x. All Bidders must turn in verification of proper licensing and insurance with bid documents. Duchesne County must be entered in as a secondary insured for the dates covering this project.
- xi. If a successful Bidder is unable or unwilling to enter into a Contract with Duchesne County subsequent to being granted an award, or who fails to perform in accordance with the Bid specifications the Bidder will be subject to damages and all other relief allowed by law.

- xii. Successful Bidders contract directly with Duchesne County and are the party or parties obligated to perform. Contracts may not be assigned or subcontracted and any failure to perform the Contract in accordance with the specifications will constitute a breach of Contract and may result in a Bidder being found to be “non-responsive” in the future. Successful Bidder agrees to not delegate performance obligations and any such delegation of responsibilities is declared void and will not relieve Successful Bidder from liability or performance obligations.
- xiii. In the evaluation of the Bids, any award will be subject to the Bid being: Administratively Compliant- Including all required bonds, insurance, established quality of work and general reputation, financial responsibility, relevant experience, and related criteria.

B. Right to Reject Bids

The County reserves the right to reject any or all bids and to waive informalities. No bids will be received after the time set for opening bids. Any unauthorized conditions, limitations, or provisions attached to the Bid, except as provided herein, will render it informal and may cause its rejection. Unbalanced bids will be subject to rejection. Any bidder may withdraw his/her bid, either personally or by written request, at any time prior to the scheduled closing time for receipt of bids. Written requests for withdrawal must be in the possession of the County prior to the closing time for receipt of bids.

IV. Official Bid

Duchesne County - 2021 Pavement Management On-Call Contract

Item	Description	Unit	Estimated Quantity*	Unit Price	Bid Total for Comparison
1	Paver with Crew	Daily Rate	10		
2	Roadway Sweeping	Daily Rate	10		
3	Trucking (Side Dump)	Hourly	100		
4	Trucking (End Dump)	Hourly	100		
5	Hot Mix Asphalt (58-28)**	Ton	500		
6	Hot Mix Asphalt (64-34)***	Ton	500		
7	Roller (Single Drum)	Daily Rate	10		
8	Roller (Double Drum)	Daily Rate	10		
9	Roller (48" Drum)	Daily Rate	10		
Total Bid for Comparison					

Contractor:

Address:

Telephone Number:

Email Address:

Bidder Name:

Bidder Signature:

Date: _____

V. Contract

A. Scope of Services

i. 2021 Pavement Management On-Call Contract

1. Duchesne County Road Department desires to contract with a qualified contractor to provide paving, sweeping, and trucking services and hot-mix asphalt material on an as-needed basis to assist the Road Department with their roadway maintenance needs.
2. To follow procurement rules, the Road Department is requesting unit prices for the following items of work, with their associated measurement and payment descriptions:

a. Bid Schedule

Item	Description	Unit	Estimated Quantity*	Unit Price	Bid Total for Comparison
1	Paver with Crew	Daily Rate	10		\$ -
2	Roadway Sweeping	Daily Rate	10		\$ -
3	Trucking (Side Dump)	Hourly	100		\$ -
4	Trucking (End Dump)	Hourly	100		\$ -
5	Hot Mix Asphalt (58-28)**	Ton	500		\$ -
6	Hot Mix Asphalt (64-34)***	Ton	500		\$ -
7	Roller (Single Drum)	Daily Rate	10		\$ -
8	Roller (Double Drum)	Daily Rate	10		\$ -
9	Roller (48" Drum)	Daily Rate	10		\$ -
Total Bid for Comparison					\$ -
Notes:					
*Estimated Quantities are given for Pricing Comparison only, they do not represent or imply that quantity of work is guaranteed; Contractor will work with County on an as-requested basis.					
**HMA 58-28 to be utilized in smaller quantities for patching and where designated, minimum of 5 tons					
***HMA 64-34 to be utilized in larger patches being done with a paver crew where designated, minimum lot of 50 tons.					

- b. Measurement and Payment is described in the attached specifications and will be utilized to quantify the work for each item.

B. Contract Period: April to December 31, 2021

C. Contract Jurisdiction, Choice of Law, and Venue

The provisions of this Contract shall be governed by the laws of the State of Utah, Duchesne County, and Duchesne City. The parties will submit to the jurisdiction of the courts of the State of Utah for any dispute arising out of this Department. Vendor agrees to be bound by the decision of Duchesne County in case of any dispute arising from the interpretation or application of the Terms and Conditions.

D. Laws and Regulations

The Parties signing below under this Contract and any and all supplies, services, equipment, and construction furnished under this Contract will comply fully with all applicable Federal, and State, and local laws, codes, rules, regulations, and ordinances, including applicable licensure and certification requirements.

E. Independent Contractor

The contractor shall be an independent Contractor, and as such, shall have no authorization, express or implied, to bind Duchesne County, or its members, to any agreements, settlements, liability, or understanding whatsoever, and agrees not to perform any acts as agent for Duchesne County, or its representatives, except as herein expressly set forth. Compensation stated herein shall be the total amount payable by Duchesne County. The Vendor shall be responsible for the payment of all income tax and Social Security amounts due as a result of payments received from Duchesne County for these Contract services. Persons employed by Duchesne County and acting under the direction of Duchesne County shall not be deemed to be employees or agents.

F. Interpretation of Contract

Any ambiguities in the contract language shall be liberally construed in favor of Duchesne County.

G. Serviceability

Any invalidation of any sections or provisions of this contract will not affect the validity of the remainder of the provision or other provisions in the contract.

H. Modification

This agreement may be supplemented, amended or modified only by the mutual agreement of the parties. No supplement, amendment, or modification of this Agreement shall be binding unless it is in writing and signed by all parties.

I. Entirety of Contract

This Agreement supersedes all other Agreements that may have been signed between the Parties prior to date of the Parties signing of this Agreement. This Agreement incorporates by reference all Contract Documents noted above.

J. Termination Clause

The County may terminate the contract resulting from this solicitation at any time the vendor fails to carry out the contract provisions, if in the opinion of the County, the performance of the contract is unreasonably delayed, or the vendor is in direct violation of the contract conditions. The County shall provide the vendor with notice of any conditions which violate or endanger the performance of the contract and, if after such notice the contractor fails to remedy such conditions within thirty (30) days, to the satisfaction of the County, the County may exercise their option in writing to terminate the Contract without further notice to the Contractor and order the Contractor to stop work immediately and vacate the premises. Vendor agrees by its bid submission that the County's decision is final and valid.

K. Indemnification and Hold Harmless Agreement

Contractor/Vendor hereby agrees to release, indemnify, defend and hold harmless the County, its Commissioners, officers, employees, subcontractors, successors, assigns and agents, from and against any and all losses (including death), claims, damages, liabilities, costs and expenses (including but not limited to all actions, proceedings, or investigations in respect thereof and any costs of judgments, settlements, court costs, attorney's fees or expenses, regardless of the outcome of any such action, proceeding, or investigation), caused by, relating to, based upon or arising out of any act or omission by contractor, its directors, officers, employees, subcontractors, successors, assigns or agents, or otherwise in connection with its acceptance, or the performance, or nonperformance, of its obligations under this agreement.

Official Bid Acceptance

IN WITNESS WHEREOF, the parties have executed this Agreement as of this day

_____ and year _____

Date: _____

(County)

Date: _____

(Bidder)

SECTION 32 12 16
ASPHALT PAVING (SUPERPAVE)

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Products and procedures for providing and/or placing and compacting surface course of one or more layers of Hot Mix Asphalt (HMA) comprised of aggregate, asphalt binder, hydrated lime, and other additives.
 - 2. Mix design by Superpave Volumetric Method.
 - 3. Option to incorporate Reclaimed Asphalt Pavement (RAP) materials into HMA pavement.
 - 4. Tack coat.
- B. Note that references to Engineer also apply to the County as the Owner, who may elect to have an Engineer representative onsite for material testing, construction observation, or other associated tasks.

1.2 UNIT PRICES – MEASUREMENT AND PAYMENT

- A. Hot Mix Asphalt (64-34):
 - 1. Basis of Measurement: By ton from weigh tickets.
 - 2. Basis of Payment: Includes mix design, tack coat, aggregate, asphalt, hydrated lime or chemical anti-stripping agent and incidental work to provide material to County; A separate item will handle hauling, placing, compacting, saw cutting, and incidental work as requested by the County. 1/2" mix required.
- B. Paver with Crew:
 - 1. Basis of Measurement: By Day (Up to 10 Hours per day)
 - 2. Basis of Payment: Includes crew, equipment, paver, and all other necessary appurtenances for mobilizing, placing, and incidental work for pavement patching, overlays, and/or lane paving as designated by County. Traffic Control will be coordinated by County and may be an additional item negotiated with Contractor.
- C. Trucking:
 - 1. Basis of Measurement: Hourly, by Each Type
 - 2. Basis of Payment: Includes mobilization, equipment, fuel, and incidental work to haul HMA and other required aggregates as designated by County.

- D. Roller:
1. Basis of Measurement: By Day, for Each Type
 2. Basis of Payment: Includes mobilization, equipment, fuel, and incidental work to compact HMA to required compaction as designated by County.
- E. Roadway Sweeping:
1. Basis of Measurement: By daily rate, up to 10 hour day
 2. Basis of Payment: Includes equipment, crew, fuel, and mobilization for sweeping of roadways prior to painting or other work as directed by the County. Traffic Control will be coordinated by County and may be an additional item negotiated with Contractor.

1.3 PRICE REDUCTION

- A. Pay Factor for Density: Engineer will calculate for each lot using Table 1 of this Section.

Table 1 Pay Factor for Density	
Percent of Rice Density (Gsb)	Pay Factor
92.5 or Greater	1.00
89 to 92.49	0.90
Less than 89	0.50

- B. Pay Factor for Gradation and Asphalt Content: Engineer will calculate for each lot.
1. Asphalt Content:
 - a. Calculate mean of deviations.
 - b. Determine pay factor by using mean of deviations and Table 2 of this Section.

Table 2 Pay Factor for Asphalt Content			
Mean of Deviations			Pay Factor
1-3 Samples	4 Samples	5 Samples	
0-0.46	0-0.41	0-0.38	1.00
0.47-0.52	0.42-0.46	0.39-0.43	0.975
0.53-0.58	0.47-0.51	0.44-0.47	0.95
0.59-0.64	0.52-0.56	0.48-0.52	0.90
0.65-0.69	0.57-0.61	0.53-0.56	0.85

2. Gradation:

- a. Calculate mean of deviations for each sieve size. Pay factor will be determined from Table 3 of this Section for each sieve size.
 - b. Pay factor for each lot will be lowest pay factor from all sieve sizes.
3. If test results for gradation or asphalt content are outside limits of 0.85 pay factor, Engineer may reject material and require removal or allow material to remain with pay factor of 0.50. Pay factor for gradation and asphalt content is lower value calculated for gradation or asphalt content.

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Table 3 Pay Factor for Gradation				
Sieve Size	Mean of Deviations			Pay Factor
	1-3 Samples	4 Samples	5 Samples	
½ Inch and Larger	0-6.3	0-5.6	0-5.2	1.00
	6.4-7.1	5.7-6.3	5.3-5.8	0.975
	7.2-7.9	6.4-7.0	5.9-6.4	0.95
	8.0-8.7	7.1-7.7	6.5-7.1	0.90
	8.8-9.5	7.8-8.4	7.2-7.7	0.85
3/8 Inch	0-5.9	0-5.3	0-4.9	1.00
	6.0-6.6	5.4-5.9	5.0-5.5	0.975
	6.7-7.3	6.0-6.6	5.6-6.1	0.95
	7.4-8.0	6.7-7.2	6.2-6.6	0.90
	8.1-8.9	7.3-7.9	6.7-7.2	0.85
No. 4	0-5.7	0-5.2	0-4.8	1.00
	5.8-6.3	5.3-5.8	4.9-5.4	0.975
	6.4-6.9	5.9-6.4	5.5-5.9	0.95
	7.0-7.5	6.5-7.0	6.0-6.5	0.90
	7.6-8.0	7.1-7.6	6.6-7.0	0.85
No. 8	0-4.8	0-4.3	0-4.0	1.00
	4.9-5.4	4.4-4.8	4.1-4.5	0.975
	5.5-6.0	4.9-5.3	4.6-4.9	0.95
	6.1-6.6	5.4-5.8	5.0-5.4	0.90
	6.7-7.2	5.9-6.4	5.5-5.8	0.85
No. 16	0-4.6	0-4.2	0-3.9	1.00
	4.7-5.1	4.3-4.6	4.0-4.3	0.975
	5.2-5.6	4.7-5.1	4.4-4.7	0.95
	5.7-6.1	5.2-5.5	4.8-5.1	0.90
	6.2-6.6	5.6-5.9	5.2-5.4	0.85
No. 50	0-3.8	0-3.4	0-3.2	1.00
	3.9-4.1	3.5-3.8	3.3-3.5	0.975
	4.2-4.5	3.9-4.1	3.6-3.8	0.95
	4.6-4.9	4.2-4.4	3.9-4.1	0.90
	5.0-5.5	4.5-4.9	4.2-4.5	0.85
No. 200	0-2.0	0-1.8	0-1.7	1.00
	2.1-2.2	1.9-2.0	1.8-1.9	0.975
	2.3-2.4	2.1-2.2	2.0-2.1	0.95
	2.5-2.7	2.3-2.4	2.2-2.3	0.90
	2.8-3.0	2.5-2.6	2.4-2.5	0.85

- C. Price Adjustment: Engineer will calculate for each lot.
 - 1. Final Pay Factor: Multiply pay factor for gradation and asphalt content times pay factor for density.
 - 2. If final pay factor is less than 0.85, Engineer may reject material and require removal, or allow material to remain in place with pay factor of 0.50.
 - 3. Multiply final pay factor times unit price for asphalt concrete mix for quantity represented by lot.
- D. Areas that exceed maximum smoothness tolerance variation of 1/4 inch in 10 feet will be assessed \$100 price reduction per grind area. Transitions at beginning and end of project limits will not be assessed.

1.4 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M140 - Standard Specification for Emulsified Asphalt.
 - 2. AASHTO M303 – Standard Specification for Lime for Asphalt Mixtures.
 - 3. AASHTO M320 - Standard Specification for Performance-Graded Asphalt Binder.
 - 4. AASHTO M323 - Standard Specification for Superpave Volumetric Mix Design.
 - 5. AASHTO T11 – Standard Method of Test for Materials Finer than 75 µm (No. 200) Sieve in Mineral Aggregates by Washing.
 - 6. AASHTO T19 – Standard Method of Test for Bulk Density ("Unit Weight") and Voids in Aggregate.
 - 7. AASHTO T27 – Standard Method of Test for Sieve Analysis of Fine and Course Aggregates.
 - 8. AASHTO T90 – Standard Method of Test for Determining the Plastic Limit and Plasticity Index of Soils.
 - 9. AASHTO T96 – Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - 10. AASHTO T104 – Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
 - 11. AASHTO T176 – Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test.
 - 12. AASHTO TP61 – Standard Method of Test for Determining the Percentage of Fracture in Coarse Aggregate.
- B. ASTM International (ASTM):
 - 1. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
 - 2. ASTM D6307 - Standard Test Method for Asphalt Content of Hot Mix Asphalt by Ignition Method

- C. Utah Department of Transportation (UDOT):
 - 1. UDOT Materials Manual of Instruction 960.

1.5 DEFINITIONS

- A. Lot: Number of tons of HMA placed in production day.
- B. Mean of Deviations: Sum of absolute values of deviations from mix design divided by number of samples in lot.
- C. Minor Target Change: Change from verified mix design gradation target on maximum of two sieves with limitations as follows:
 - 1. Maximum allowable change in target gradation on #8 or any coarser sieve is limited to 3 percent passing per sieve.
 - 2. Maximum allowable change in target gradation on #16 or #50 sieves is 2 percent passing per sieve.
 - 3. Maximum allowable change in target gradation on #200 sieve is 0.5 percent passing.
 - 4. No target change may violate mix design requirements.
- D. Non-Permeable HMA: Asphalt pavement that water will not penetrate through mix when water is placed on surface of pavement.
- E. Production Day: 24 hour period in which HMA is being placed.
- F. Recycled Asphalt Pavement (RAP): Crushed or milled asphalt materials that have been removed from pavements. Aggregates contained in these materials are required to meet material requirements of Article 2.1 of this Section, except sand equivalent.

1.6 SUBMITTALS

- A. Product Data:
 - 1. Submit product information for asphalt and aggregate materials.
 - 2. Submit mix design with laboratory test results supporting design.
- B. Aggregate Source: Identify source and submit test results showing aggregate meets requirements of Article 2.1 of this Section.
- C. Mix design: Submit at least 10 days before paving begins.
 - 1. Include test data used to develop mix design.
 - 2. Indicate single value for percentage of aggregate passing each sieve and asphalt cement content. Provide gradation within each band shown on Table 4 of this Section.
- D. Changes to Mix Design: Submit in writing prior to production.
- E. Corrective action plan according to Article 3.4 of this Section.

- F. Weigh Tickets: Submit to Engineer/County at end of each work day for payment purposes
- G. Sample: Provide sample to Engineer for calibration of burn off oven.

1.7 QUALITY ASSURANCE

- A. Mixing Plant: Conform to UDOT standards.
- B. Obtain materials from same source throughout Work.

1.8 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with minimum of 5 years' experience.

1.9 LIMITATIONS

- A. Do not place hot mix asphalt between October 16 and April 14.
- B. Do not place hot mix asphalt when ambient air or base surface temperature is less than 50 degrees Fahrenheit, or surface is wet or frozen.
- C. Do not place hot mix asphalt when base has free surface water, base is over saturated, or frozen.
- D. Do not place hot mix asphalt during adverse weather conditions such as rain.
- E. Use release agent that does not dissolve asphalt and is acceptable to Engineer for equipment and hand tools used to mix, haul, and place HMA.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Asphalt Binder:
 - 1. Performance Graded (PG) Asphalt Binder: **PG64-34** in accordance with Table 1 of AASHTO M320.
- B. Anti-Striping Agent: Use one of following materials.
 - 1. Chemical anti-striping agent as accepted by Engineer.
 - 2. Hydrated Lime: AASHTO M303, use minimum 1 percent of dry weight of aggregate.
 - a. Hydrated Lime Chemical Limits:
 - 1) Hydrated Alkalinity: Minimum 90 percent by weight CaCO_3 .
 - 2) Hydrated Lime Content: Maximum 7 percent by weight CaO .

- 3) Free Water Content: Maximum 3 percent by weight.
- b. Hydrated Lime Physical Requirements:
 - 1) Residue Retained on No. 30 Sieve: Maximum 2 percent by weight.
 - 2) Residue Retained on No. 200 Sieve: Maximum 12 percent by weight.
- C. Aggregate: Natural gravel, crushed rock, or slag with uniform density and quality. Gradation per Table 4 of this Section.
- D. Course Aggregate: Clean, hard, durable, and sound fragments free from organic matter or other detrimental substances.
 1. Retained on No. 4 sieve.
 2. AASHTO TP61 - One Fractured Face 90% Minimum, Two Fractured Face 80% Minimum.
- E. Fine Aggregate: Clean, hard grained, and angular.
 1. Passing No. 4 sieve.
 2. Non-plastic in accordance with AASHTO T90.
 3. Vegetable Matter or Other Detrimental Substances: Maximum 2 percent by weight.
 4. Dry-Rodded Unit Weight: AASHTO T19, minimum 75 pounds per cubic foot.
 5. Wear: AASHTO T96, maximum 40 percent.
 6. Weight Loss: AASHTO T104, maximum 16 percent by weight when subjected to five cycles of sodium sulfate.
 7. Sand Equivalent: AASHTO T176, minimum 40.

Table 4 Aggregate Gradations (Percent Passing by Dry Weight of Aggregate)					
Sieve Size		1 Inch Mix	¾ Inch Mix	½ Inch Mix	⅜ Inch Mix
Control Sieves	1½ inch	100.0			
	1 inch	90.0 - 100.0	100.0		
	¾ inch	<90	90.0 - 100.0	100.0	
	½ inch		<90	90.0 – 100.0	100.0
	⅜ inch			<90	90.0 - 100.0
	No. 4				< 90
	No. 8	19.0 - 45.0	23.0 - 49.0	28.0 - 58.0	32.0 - 67.0
	No. 200	1.0 - 7.0	2.0 - 8.0	2.0 – 10.0	2.0 – 10.0

- F. Reclaimed Asphalt Pavement (RAP): Not required, but may be used.
 1. Do not adjust asphalt binder grade if lower end is already PG XX-34.
 2. Do not adjust asphalt binder grade when RAP content is not more than 15 percent by total weight of hot mix and RAP asphalt binder

- content is not more than 15 percent of total asphalt binder content by weight.
3. Adjust asphalt binder grade according to AASHTO M323 when RAP asphalt binder content is between 15 to 20 percent of asphalt binder weight.
 - a. Select one grade softer than grade specified. Do not adjust asphalt binder grade if lower end is already PG XX-34.
 - b. Provide test reports indicating that PG grade and quantity of recovered asphalt binder is consistent throughout stockpile.
 - c. Limit RAP to 20 percent of total weight of hot mix asphalt and RAP binder to 20 percent of total binder.
 4. RAP aggregate is required to meet material requirements of Article 2.1 of this Section, except sand equivalent.
- G. Provide HMA mix that when placed and compacted on finish grade will produce non-permeable HMA.
- H. Warm Mix: Meet design requirements of HMA.

2.2 EQUIPMENT

- A. Asphalt Paver: Use self-propelled paver with screed. Paver must be equipped with acceptable automatic control system, which controls longitudinal grade and transfer slope, except when paving miscellaneous areas or when Engineer determines use of automatic control system is impractical. Use pick up conveyor or shuttle buggy to transfer HMA from windrow to paver.
- B. Asphaltic Mixture Hauling Vehicles: Use trucks with tight clean and smooth boxes. End-Dump type vehicles are prohibited from dumping directly into paver.
- C. Rollers: Use rubber tire and steel self-propelled rollers in sufficient number to keep up with paver. Use release agent other than diesel.

2.3 VOLUMETRIC DESIGN

- A. Perform Superpave Volumetric Mix Design according to UDOT Materials Manual of Instruction 960 and as follows:
 1. Determine optimum asphalt content by test data curves.
 2. Use test samples containing 0.5 percent increments of asphalt content.
 3. Include minimum of 2 test samples above and below optimum asphalt content.
- B. Mix Design Requirements:
 1. Hamburg Wheel Tracker: Maximum 10 mm impression at 20,000 passes.

2. Number of Gyration:
 - a. N-initial = 7.
 - b. N-design = 75.
 - c. N-final = 115.
 3. Air Voids: 3 percent.
 4. Voids in Mineral Aggregate (VMA):
 - a. $\frac{3}{4}$ Inch Mix: 13.0% - 14%.
 - b. $\frac{1}{2}$ Inch Mix: 14.0% - 15.0%.
 - c. $\frac{3}{8}$ Inch Mix: 15.0% - 16.0%.
 5. Voids Filled with Asphalt (VFA): 70-80.
- C. If material source changes, develop new mix design prior to using new materials.
- D. Mix materials at central mixing plant. Use shortest mixing time needed to uniformly coat aggregate. Do not use material not mixed properly.
- E. Adjust production at mixing plant and delivery to maintain steady paving speed.
- F. Mix Design Changes:
 1. Engineer may allow up to two minor target changes per project without penalty to contractor. Engineer will charge \$1,000 for each additional minor target change.

2.4 TACK COAT

- A. Tack Coat: AASHTO M140, grade SS-1H or SS-1, emulsified asphalt.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.
- B. Verify gradients and elevations of base are correct. Do not place asphalt concrete pavement until base course has been accepted.

3.2 PREPARATION

- A. Locate and reference utility covers prior to paving operations.
- B. Where new pavement joins existing pavement, saw cut edge of existing pavement. Provide saw cut through full depth of pavement and in straight line. If pavement is cracked, broken or deteriorated, make saw cut so defective area is removed. Properly dispose of pavement removed by saw cutting.

- C. Remove dirt, sand, leaves, and other objectionable materials from prepared surfaces.
- D. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.
- E. Repair surface defects in existing paving to provide uniform surface to receive new paving.

3.3 INSTALLATION

- A. Tack Coat:
 - 1. Apply tack coat at applicable rate indicated in Table 5 of this Section. Review application rate with Engineer prior to placing tack coat.
 - 2. Apply tack coat to contact surfaces of curbs, gutters, existing pavement, previously placed asphalt pavement and other surfaces. Apply tack coat to all asphalt pavement joints.
 - 3. Apply tack coat same day hot mix asphalt is placed.
 - 4. If previous pass has cooled below 175 degrees Fahrenheit, then apply tack coat to longitudinal edge before placing adjacent pavement.

Table 5 Tack Coat Application Rate (gal/yd ²)				
Pavement Condition	Residual	Undiluted	1:1 Dilute	2:1 Dilute
New HMA	0.03	0.05	0.10	0.08
Oxidized HMA	0.05	0.09	0.18	0.13
Milled HMA	0.07	0.12	0.24	0.18
Residual: Asphalt binder content needed on pavement. Undiluted and 1:1 and 2:1 Dilute: Adjust application rate if emulsion is not 60 percent residual asphalt.				

- B. Single Course HMA Paving:
 - 1. Place HMA to thickness indicated on Drawings.
 - 2. Compact paving by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
 - 3. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.
- C. Double Course HMA Paving:
 - 1. Provide minimum compacted course thickness of 3 time's nominal maximum aggregate size.
 - 2. Place first course of hot mix asphalt to appropriate compacted thickness.

3. Place second course of hot mix asphalt within 24 hours of placing and compacting first course. When first course is placed more than 24 hours before placing second course, clean surface and apply tack coat before placing second course.
 4. Compact each course by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
 5. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.
- D. HMA Lane Leveling:
1. Apply tack coat to existing paving surface.
 2. Vary depth as necessary to fill low areas.
 3. Compact by rolling to indicated density. Achieve even and smooth finish without roller marks.
 4. Apply lane leveling prior to overlay and other improvements.
- E. HMA Paving Overlay:
1. Apply tack coat to existing paving and lane leveling surface at rate indicated.
 2. Provide minimum compacted course thickness of 3 times nominal maximum aggregate size.
 3. Compact overlay by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
 4. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.
- F. Place HMA at temperature between 250 and 325 degrees Fahrenheit with self-propelled laydown machine. Adjust paver speed to match plant production and delivery for continuous paving operation.
- G. Provide 3:1 (horizontal to vertical) sloped edge to adjacent lane to be paved when full-width or Echelon paving is impractical and more than one pass is required.
- H. Joints:
1. Offset longitudinal joints 6 to 12 inches in succeeding courses.
 2. Place top course joint within one foot of roadway centerline or lane line.
 3. Offset transverse construction joints at least 6 feet.
 4. For roller breakdown pass on confined edge, keep 6 inches from confined edge on hot side of mat to ensure joint density.
 5. For roller breakdown pass on unconfined edge, overlap unconfined edge at least 6 inches off of mat to prevent pavement from spreading.
 6. Compact joint density to at least 90 percent of rice density.
 7. Overlap screed onto previously placed mat $\frac{3}{4}$ to 1 inch maximum.

8. Do not rake longitudinal joint.
- I. Where exposed to traffic, taper end of course at approximately 50:1 (horizontal to vertical).
 1. Remove portion of course that contains tapered end before placing fresh hot mix asphalt.
 2. Apply tack coat to contact surfaces of first course before fresh hot mix asphalt is placed against first course.
- J. Hand rake only when necessary.

3.4 CEASE PRODUCTION

- A. Cease production when any two out of three consecutive lots meet one of the following criteria:
 1. Pay factor is less than 1.00.
 2. Air voids at N-design averaged for each lot are less than 2.5 or greater than 4.75 percent.
 3. VMA at N-design averaged for each lot are not within plus or minus 1.25 percent of target value.
- B. Submit corrective action plan to Engineer before production continues indicating changes in production procedures that will be implemented to correct deficiencies. Address specific issues contributing to cease production directive. Submit for Engineer to review and accept revised plan before production continues.
- C. Engineer may require new mix design.
- D. Engineer may require Hamburg Wheel-Track testing for up to 5 lots after cease production order at no additional expense to Owner.
 1. Engineer will take random sample at location behind paver for up to 5 lots after cease production order.
 2. Failure to meet mix design requirements will result in rejection of lot.

3.5 TOLERANCES

- A. Smoothness: Maximum variation of 1/4 inch measured longitudinally, transversely, and at construction joints with 10 foot straight edge or string line. Correct depressions or humps exceeding tolerances.
- B. Compacted Thickness:
 1. Owner accepts lot for thickness when:
 - a. Average thickness of all sublots is not more than 1/2 inch greater, or 1/4 inch less than total thickness specified.
 - b. No individual subplot shows deficient thickness of more than 3/8 inch.

2. Excess Thickness: Engineer may allow excess thickness to remain in place or may order excess thickness to be removed.
 - a. Owner will pay for 50 percent of HMA in excess of 1/2 inch tolerance when excess thickness is allowed to remain in place.
 - b. Deficient Thickness: Place additional material where lots or sublots are deficient in thickness.
 - 1) Owner will pay for HMA necessary to reach specified thickness.
 - 2) If excess HMA is placed, Owner will pay for 50 percent of HMA over specified thickness.

C. Variation from Indicated Elevation: Within 1/2 inch.

3.6 FIELD ACCEPTANCE TESTING

- A. Gradation and Asphalt Content: Engineer will take random samples immediately behind paver before compaction and test in accordance with AASHTO T11 and T27 and ASTM D6307.
 1. Frequency: Per Table 6 of this Section.
 2. If tests indicate materials are not acceptable, make adjustments in production. If necessary, remove and replace work. Lot may be evaluated on basis of fewer samples when minimum number cannot be obtained.

Table 6 Gradation and Asphalt Content Sampling	
Lot (tons)	Minimum No. of Samples
Greater than 2,500	4
1,500 to 2,500	3
Less than 1,500	2

- B. Density: Engineer will perform density tests with nuclear gage in accordance with ASTM D2950 or take core samples.
 1. Acceptance will be based on average of all density determinations made per lot.
 2. Lot will be divided into sublots of approximately 1,500 square yards. Take minimum of one density determination for each subplot. Determine test location using random numbers table.
 3. Pay factors will be determined in accordance with Table 1 of this Section.
- C. Joint Density: Engineer will perform density tests with nuclear gage in accordance with ASTM D2950 or take core samples.
 1. Acceptance will be based on average of all density determinations made per lot.

2. Lot will be divided into 5 sublots of approximately 1,500 square yards. Take minimum of one density determination for each subplot. Determine test location using random numbers table.
3. Joint density for each individual subplot shall be not less than 90 percent of rice density. Engineer may require corrective action plan if joint density falls below 90 percent of rice density.

D. HMA Temperature: Measure temperature at time of placement.

3.7 PROTECTION

- A. Do not allow traffic to cross saw cut edge of existing pavement unless temporary ramp is constructed.
- B. Protect structures, and other objects from being spattered or marred by tack coat.
- C. Do not allow construction vehicles, general traffic, or rollers to pass over uncompacted end or edge of freshly placed mix until mat temperature drops to point where damage or differential compaction will not occur.
- D. Immediately after placement, protect paving from mechanical injury for 3 hours or until surface temperature is less than 140 degrees Fahrenheit. Prevent traffic from crossing vertical edge of pavement.

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING (MARSHALL)

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Products and procedures for placing and compacting surface course of one or more layers of Hot Mix Asphalt (HMA) comprised of aggregate, asphalt binder, hydrated lime, and other additives.
 - 2. Mix design by Marshall Method.
 - 3. Option to incorporate Reclaimed Asphalt Pavement (RAP) materials into HMA pavement.
 - 4. Tack coat.
- B. Note that references to Engineer also apply to the County as the Owner, who may elect to have an Engineer representative onsite for material testing, construction observation, or other associated tasks.

1.2 UNIT PRICES – MEASUREMENT AND PAYMENT

- A. Hot Mix Asphalt (58-28):
 - 1. Basis of Measurement: By ton from weigh tickets.
 - 2. Basis of Payment: Includes mix design, tack coat, aggregate, asphalt, hydrated lime or chemical anti-stripping agent and incidental work to provide material to County; A separate item will handle hauling, placing, compacting, saw cutting, and incidental work as requested by the County.
- B. Roadway Sweeping:
 - 1. Basis of Measurement: By daily rate, up to 10 hour day
 - 2. Basis of Payment: Includes equipment, crew, fuel, and mobilization for sweeping of roadways prior to painting or other work as directed by the County. Traffic Control will be coordinated by County and may be an additional item negotiated with Contractor.
- 3. Paver with Crew:
 - 1. Basis of Measurement: By Day (Up to 10 Hours per day)
 - 2. Basis of Payment: Includes crew, equipment, paver, and all other necessary appurtenances for mobilizing, placing, and incidental work for pavement patching, overlays, and/or lane paving as designated by County. Traffic Control will be coordinated by County and may be an additional item negotiated with Contractor.
- 4. Trucking:
 - 1. Basis of Measurement: Hourly, by Each Type

2. Basis of Payment: Includes mobilization, equipment, fuel, and incidental work to haul HMA and other required aggregates as designated by County.

5. Roller:

1. Basis of Measurement: By Day, for Each Type
2. Basis of Payment: Includes mobilization, equipment, fuel, and incidental work to compact HMA to required compaction as designated by County.

1.3 PRICE REDUCTION

- A. Pay Factor for Density: Engineer will calculate for each lot using Table 1 of this Section.

Table 1 Pay Factor for Density	
Percent of Marshall Density	Pay Factor
96 or Greater	1.00
92 to 95	0.90
Less than 92	0.50

- B. Pay Factor for Gradation and Asphalt Content: Engineer will calculate for each lot.

1. Asphalt Content:
 - a. Calculate mean of deviations.
 - b. Determine pay factor by using mean of deviations and Table 2 of this Section.

Table 2 Pay Factor for Asphalt Content			
Mean of Deviations			Pay Factor
1-3 Samples	4 Samples	5 Samples	
0-0.46	0-0.41	0-0.38	1.00
0.47-0.52	0.42-0.46	0.39-0.43	0.975
0.53-0.58	0.47-0.51	0.44-0.47	0.95
0.59-0.64	0.52-0.56	0.48-0.52	0.90
0.65-0.69	0.57-0.61	0.53-0.56	0.85

2. Gradation:
 - a. Calculate mean of deviations for each sieve size. Pay factor will be determined from Table 3 of this Section for each sieve size.

- b. Pay factor for each lot will be lowest pay factor from all sieve sizes.
- 3. If test results for gradation or asphalt content are outside limits of 0.85 pay factor, Engineer may reject material and require removal or allow material to remain with pay factor of 0.50. Pay factor for gradation and asphalt content is lower value calculated for gradation or asphalt content.

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Table 3 Pay Factor for Gradation				
Sieve Size	Mean of Deviations			Pay Factor
	1-3 Samples	4 Samples	5 Samples	
½ Inch and Larger	0-6.3	0-5.6	0-5.2	1.00
	6.4-7.1	5.7-6.3	5.3-5.8	0.975
	7.2-7.9	6.4-7.0	5.9-6.4	0.95
	8.0-8.7	7.1-7.7	6.5-7.1	0.90
	8.8-9.5	7.8-8.4	7.2-7.7	0.85
3/8 Inch	0-5.9	0-5.3	0-4.9	1.00
	6.0-6.6	5.4-5.9	5.0-5.5	0.975
	6.7-7.3	6.0-6.6	5.6-6.1	0.95
	7.4-8.0	6.7-7.2	6.2-6.6	0.90
	8.1-8.9	7.3-7.9	6.7-7.2	0.85
No. 4	0-5.7	0-5.2	0-4.8	1.00
	5.8-6.3	5.3-5.8	4.9-5.4	0.975
	6.4-6.9	5.9-6.4	5.5-5.9	0.95
	7.0-7.5	6.5-7.0	6.0-6.5	0.90
	7.6-8.0	7.1-7.6	6.6-7.0	0.85
No. 8	0-4.8	0-4.3	0-4.0	1.00
	4.9-5.4	4.4-4.8	4.1-4.5	0.975
	5.5-6.0	4.9-5.3	4.6-4.9	0.95
	6.1-6.6	5.4-5.8	5.0-5.4	0.90
	6.7-7.2	5.9-6.4	5.5-5.8	0.85
No. 16	0-4.6	0-4.2	0-3.9	1.00
	4.7-5.1	4.3-4.6	4.0-4.3	0.975
	5.2-5.6	4.7-5.1	4.4-4.7	0.95
	5.7-6.1	5.2-5.5	4.8-5.1	0.90
	6.2-6.6	5.6-5.9	5.2-5.4	0.85
No. 50	0-3.8	0-3.4	0-3.2	1.00
	3.9-4.1	3.5-3.8	3.3-3.5	0.975
	4.2-4.5	3.9-4.1	3.6-3.8	0.95
	4.6-4.9	4.2-4.4	3.9-4.1	0.90
	5.0-5.5	4.5-4.9	4.2-4.5	0.85
No. 200	0-2.0	0-1.8	0-1.7	1.00
	2.1-2.2	1.9-2.0	1.8-1.9	0.975
	2.3-2.4	2.1-2.2	2.0-2.1	0.95
	2.5-2.7	2.3-2.4	2.2-2.3	0.90
	2.8-3.0	2.5-2.6	2.4-2.5	0.85

C. Price Adjustment: Engineer will calculate for each lot.

1. Final Pay Factor: Multiply pay factor for gradation and asphalt content time's pay factor for density.
2. If final pay factor is less than 0.85, Engineer may reject material and require removal, or allow material to remain in place with pay factor of 0.50.
3. Multiply final pay factor time's unit price for asphalt concrete mix for quantity represented by lot.

1.4 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO):
 1. AASHTO M140 - Standard Specification for Emulsified Asphalt.
 2. AASHTO M226 - Standard Specification for Viscosity-Graded Asphalt Cement.
 3. AASHTO M303 - Standard Specification for Lime for Asphalt Mixtures.
 4. AASHTO M320 - Standard Specification for Performance-Graded Asphalt Binder.
 5. AASHTO M323 - Standard Specification for Superpave Volumetric Mix Design.
 6. AASHTO T11 - Standard Method of Test for Materials Finer than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing.
 7. AASHTO T19 - Standard Method of Test for Bulk Density ("Unit Weight") and Voids in Aggregate.
 8. AASHTO T27 - Standard Method of Test for Sieve Analysis of Fine and Course Aggregates.
 9. AASHTO T90 - Standard Method of Test for Determining the Plastic Limit and Plasticity Index of Soils.
 10. AASHTO T96 - Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 11. AASHTO T104 - Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
 12. AASHTO T176 - Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test.
 13. AASHTO TP61 - Standard Method of Test for Determining the Percentage of Fracture in Coarse Aggregate.
- B. ASTM International (ASTM):
 1. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
 2. ASTM D6307 - Standard Test Method for Asphalt Content of Hot Mix Asphalt by Ignition Method
- C. The Asphalt Institute (TAI):

1. TAI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.

1.5 DEFINITIONS

- A. Lot: Number of tons of HMA placed in production day.
- B. Mean of Deviations: Sum of absolute values of deviations from mix design divided by number of samples in lot.
- C. Non-Permeable HMA: Asphalt pavement that water will not penetrate through mix when water is placed on surface of pavement.
- D. Production Day: 24 hour period in which HMA is being placed.
- E. Recycled Asphalt Pavement (RAP): Crushed or milled asphalt materials that have been removed from pavements. Aggregates contained in these materials are required to meet material requirements of Article 2.1 of this Section, except sand equivalent.

1.6 SUBMITTALS

- A. Product Data:
 1. Submit product information for asphalt and aggregate materials.
 2. Submit mix design with laboratory test results supporting design.
- B. Aggregate Source: Identify source and submit test results showing aggregate meets requirements of Article 2.1 of this Section.
- C. Mix design: Submit at least 10 days before paving begins.
 1. Include test data used to develop mix design.
 2. Indicate single value for percentage of aggregate passing each sieve and asphalt cement content. Provide gradation within each band shown on Table 4 of this Section.
- D. Changes to Mix Design: Submit in writing prior to production.
- E. Corrective action plan according to Article 3.4 of this Section.
- F. Weigh Tickets: Submit to Engineer/County at end of each work day for payment purposes.
- G. Sample: Provide sample to Engineer for calibration of burn off oven.

1.7 QUALITY ASSURANCE

- A. Obtain materials from same source throughout Work.

1.8 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with minimum of 5 years' experience.

1.9 LIMITATIONS

- A. Do not place hot mix asphalt between October 16 and April 14.
- B. Do not place hot mix asphalt when ambient air or base surface temperature is less than 50 degrees Fahrenheit, or surface is wet or frozen.
- C. Do not place hot mix asphalt when base has free surface water, base is over saturated, or frozen.
- D. Do not place hot mix asphalt during adverse weather conditions such as rain.
- E. Use release agent that does not dissolve asphalt and is acceptable to Engineer for equipment and hand tools used to mix, haul, and place HMA.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Asphalt Binder:
 - 1. Performance Graded (PG) Asphalt Binder: PG58-28 in accordance with Table 1 of AASHTO M320, or AC10 in accordance with Table 2 of AASHTO M226.
- B. Anti-Striping Agent: Use one of following materials.
 - 1. Chemical anti-striping agent as accepted by Engineer.
 - 2. Hydrated Lime: AASHTO M303, use minimum 1 percent of dry weight of aggregate.
 - a. Hydrated Lime Chemical Limits:
 - 1) Hydrated Alkalinity: Minimum 90 percent by weight CaCO_3 .
 - 2) Hydrated Lime Content: Maximum 7 percent by weight CaO .
 - 3) Free Water Content: Maximum 3 percent by weight.
 - b. Hydrated Lime Physical Requirements:
 - 1) Residue Retained on No. 30 Sieve: Maximum 2 percent by weight.
 - 2) Residue Retained on No. 200 Sieve: Maximum 12 percent by weight.
- C. Aggregate: Natural gravel, crushed rock, or slag with uniform density and quality. Gradation per Table 4 of this Section.

- D. Course Aggregate: Clean, hard, durable, and sound fragments free from organic matter or other detrimental substances.
1. Retained on No. 4 sieve.
 2. All Rounded Particles: Maximum 50 percent by weight.
- E. Fine Aggregate: Clean, hard grained, and angular.
1. Passing No. 4 sieve.
 2. Non-plastic in accordance with AASHTO T90.
 3. Vegetable Matter or Other Detrimental Substances: Maximum 2 percent by weight.
 4. Dry-Rodded Unit Weight: AASHTO T19, minimum 75 pounds per cubic foot.
 5. Wear: AASHTO T96, maximum 40 percent.
 6. Weight Loss: AASHTO T104, maximum 16 percent by weight when subjected to five cycles of sodium sulfate.
 7. Sand Equivalent: AASHTO T176, minimum 40.

Table 4 Gradation Limits for Mix Design	
Sieve Size	Percent of Total Aggregate Passing (Dry Weight)
½ inch	100
No. 4	60-80
No. 16	28-42
No. 50	11-23
No. 200	5-9

- F. Reclaimed Asphalt Pavement (RAP): Not required, but may be used.
1. Do not adjust asphalt binder grade if lower end is already PG XX-34.
 2. Do not adjust asphalt binder grade when RAP content is not more than 15 percent by total weight of hot mix and RAP asphalt binder content is not more than 15 percent of total asphalt binder content by weight.
 3. Adjust asphalt binder grade according to AASHTO M323 when RAP asphalt binder content is between 15 to 20 percent of asphalt binder weight.
 - a. Select one grade softer than grade specified. Do not adjust asphalt binder grade if lower end is already PG XX-34.
 - b. Provide test reports indicating that PG grade and quantity of recovered asphalt binder is consistent throughout stockpile.
 - c. Limit RAP to 20 percent of total weight of hot mix asphalt and RAP binder to 20 percent of total binder.

- 4. RAP aggregate is required to meet material requirements of Article 2.1 of this Section, except sand equivalent.
- G. Provide HMA mix that when placed and compacted on finish grade will produce non-permeable HMA.
- H. Warm Mix: Meet design requirements of HMA.

2.2 EQUIPMENT

- A. Asphalt Paver: Use self-propelled paver with screed. Paver must be equipped with acceptable automatic control system, which controls longitudinal grade and transfer slope, except when paving miscellaneous areas or when Engineer determines use of automatic control system is impractical.
- B. Asphaltic Mixture Hauling Vehicles: Use trucks with tight clean and smooth boxes.
- C. Rollers: Use rubber tire and steel self-propelled rollers in sufficient number to keep up with paver. Use release agent other than diesel.

2.3 MIX DESIGN

- A. Develop mix design in accordance with TAI MS-2, Marshall Method
 - 1. Determine optimum asphalt content by test data curves.
 - 2. Use test samples containing 0.5 percent increments of asphalt content.
 - 3. Include minimum of 2 test samples above and below optimum asphalt content.
- B. Mix Design Requirements:
 - 1. Marshall Stability: Minimum 1,800 pounds.
 - 2. Flow (0.01 inch): 10 to 18.
 - 3. Air Voids: 3 to 5 percent.
 - 4. Voids in Mineral Aggregate: Minimum 14 percent.
 - 5. Index of Retained Strength: Minimum 75 percent.
 - 6. Dry Stability: Minimum 200 pounds per square inch.
- C. If material source changes, develop new mix design prior to using new materials.
- D. Mix materials at central mixing plant. Use shortest mixing time needed to uniformly coat aggregate. Do not use material not mixed properly.
- E. Adjust production at mixing plant and delivery to maintain steady paving speed.

2.4 TACK COAT

- A. Tack Coat: AASHTO M140, grade SS-1H or SS-1, emulsified asphalt.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.
- B. Verify gradients and elevations of base are correct. Do not place asphalt concrete pavement until base course has been accepted.

3.2 PREPARATION

- A. Locate and reference utility covers prior to paving operations.
- B. Where new pavement joins existing pavement, saw cut edge of existing pavement. Provide saw cut through full depth of pavement and in straight line. If pavement is cracked, broken or deteriorated, make saw cut so defective area is removed. Properly dispose of pavement removed by saw cutting.
- C. Remove dirt, sand, leaves, and other objectionable materials from prepared surfaces.
- D. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.
- E. Repair surface defects in existing paving to provide uniform surface to receive new paving.

3.3 INSTALLATION

- A. Tack Coat:
 - 1. Apply tack coat at applicable rate indicated in Table 5 of this Section. Review application rate with Engineer prior to placing tack coat.
 - 2. Apply tack coat to contact surfaces of curbs, gutters, existing pavement, previously placed asphalt pavement and other surfaces. Apply tack coat to all asphalt pavement joints.
 - 3. Apply tack coat same day hot mix asphalt is placed.
 - 4. If previous pass has cooled below 175 degrees Fahrenheit, then apply tack coat to longitudinal edge before placing adjacent pavement.

Table 5 Tack Coat Application Rate (gal/yd ²)				
Pavement Condition	Residual	Undiluted	1:1 Dilute	2:1 Dilute
New HMA	0.03	0.05	0.10	0.08
Oxidized HMA	0.05	0.09	0.18	0.13
Milled HMA	0.07	0.12	0.24	0.18
Residual: Asphalt binder content needed on pavement. Undiluted and 1:1 and 2:1 Dilute: Adjust application rate if emulsion is not 60 percent residual asphalt.				

- B. Single Course HMA Paving:
1. Place HMA to thickness indicated on Drawings.
 2. Compact paving by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
 3. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.
- C. Double Course HMA Paving:
1. Provide minimum compacted course thickness of 3 time's nominal maximum aggregate size.
 2. Place first course of hot mix asphalt to appropriate compacted thickness.
 3. Place second course of hot mix asphalt within 24 hours of placing and compacting first course. When first course is placed more than 24 hours before placing second course, clean surface and apply tack coat before placing second course.
 4. Compact each course by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
 5. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.
- D. HMA Lane Leveling:
1. Apply tack coat to existing paving surface.
 2. Vary depth as necessary to fill low areas.
 3. Compact by rolling to indicated density. Achieve even and smooth finish without roller marks.
 4. Apply lane leveling prior to overlay and other improvements.
- E. HMA Paving Overlay:
1. Apply tack coat to existing paving and lane leveling surface at rate indicated.
 2. Provide minimum compacted course thickness of 3 time's nominal maximum aggregate size.

3. Compact overlay by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
 4. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.
- F. Place HMA at temperature between 250 and 325 degrees Fahrenheit with self-propelled laydown machine. Adjust paver speed to match plant production and delivery for continuous paving operation.
- G. Provide 3:1 (horizontal to vertical) sloped edge to adjacent lane to be paved when full-width or Echelon paving is impractical and more than one pass is required.
- H. Joints:
1. Offset longitudinal joints 6 to 12 inches in succeeding courses.
 2. Place top course joint within one foot of roadway center line or lane line.
 3. Offset transverse construction joints at least 6 feet.
 4. For roller breakdown pass on confined edge, keep 6 inches from confined edge on hot side of mat to ensure joint density.
 5. For roller breakdown pass on unconfined edge, overlap unconfined edge at least 6 inches off of mat to prevent pavement from spreading.
 6. Compact joint density to at least 92 percent of Marshall density.
 7. Overlap screed onto previously placed mat $\frac{3}{4}$ to 1 inch maximum.
 8. Do not rake longitudinal joint.
- I. Hand rake only when necessary.

3.4 CEASE PRODUCTION

- A. Cease production when any two out of three consecutive lots meet one of following criteria:
1. Pay factor is less than 1.00.
 2. Air voids are not within tolerance.
 3. VMA averaged for each lot are not within plus or minus 1.25 percent of target value.
- B. Submit corrective action plan to Engineer before production continues indicating changes in production procedures that will be implemented to correct deficiencies. Address specific issues contributing to cease production directive. Submit for Engineer to review and accept revised plan before production continues.
- C. Engineer may require new mix design.

3.5 TOLERANCES

- A. Smoothness: Maximum variation of 1/4 inch measured longitudinally, transversely, and at construction joints with 10 foot straight edge or string line. Correct depressions or humps exceeding tolerances.
- B. Compacted Thickness:
 - 1. Owner accepts lot for thickness when:
 - a. Average thickness of all sublots is not more than 1/2 inch greater, or 1/4 inch less than total thickness specified.
 - b. No individual sublot shows deficient thickness of more than 3/8 inch.
 - 2. Excess Thickness: Engineer may allow excess thickness to remain in place or may order excess thickness to be removed.
 - a. Owner will pay for 50 percent of HMA in excess of 1/2 inch tolerance when excess thickness is allowed to remain in place.
 - b. Deficient Thickness: Place additional material where lots or sublots are deficient in thickness.
 - 1) Owner will pay for HMA necessary to reach specified thickness.
 - 2) If excess HMA is placed, Owner will pay for 50 percent of HMA over specified thickness.
- C. Variation from Indicated Elevation: Within 1/2 inch.

3.6 FIELD ACCEPTANCE TESTING

- A. Gradation and Asphalt Content: Engineer will take random samples immediately behind paver before compaction and test in accordance with AASHTO T11 and T27 and ASTM D6307.
 - 1. Frequency: Per Table 6 of this Section.
 - 2. If tests indicate materials are not acceptable, make adjustments in production. If necessary, remove and replace work. Lot may be evaluated on basis of fewer samples when minimum number cannot be obtained.

Table 6	
Gradation and Asphalt Content Sampling	
Lot (tons)	Minimum No. of Samples
Greater than 2,500	4
1,500 to 2,500	3
Less than 1,500	2

- B. Density: Engineer will perform density tests with nuclear gage in accordance with ASTM D2950 or take core samples.

1. Acceptance will be based on average of all density determinations made per lot.
 2. Lot will be divided into sublots of approximately 1,500 square yards. Take minimum of one density determination for each sublot. Determine test location using random numbers table.
 3. Pay factors will be determined in accordance with Table 1 of this Section.
- C. Joint Density: Engineer will perform density tests with nuclear gage in accordance with ASTM D2950 or take core samples.
1. Acceptance will be based on average of density determinations made per lot.
 2. Lot will be divided into 5 sublots of approximately 1,500 square yards. Take minimum of one density determination for each sublot. Determine test location using random numbers table.
 3. Joint density for each individual sublot shall be not less than 92 percent of Marshall density. Engineer may require corrective action plan if joint density falls below 92 percent of Marshall density.
- D. HMA Temperature: Measure temperature at time of placement.

3.7 PROTECTION

- A. Do not allow traffic to cross saw cut edge of existing pavement unless temporary ramp is constructed.
- B. Protect structures, and other objects from being spattered or marred by tack coat.
- C. Do not allow construction vehicles, general traffic, or rollers to pass over uncompacted end or edge of freshly placed mix until mat temperature drops to point where damage or differential compaction will not occur.
- D. Immediately after placement, protect paving from mechanical injury for 3 hours or until surface temperature is less than 140 degrees Fahrenheit. Prevent traffic from crossing vertical edge of pavement.

END OF SECTION